**1.1 Markets, Demand and Supply**

*Linear Demand and Supply functions*

**Introduction:** The following activity is designed to accompany the HL sections of the textbook[*Pearson Baccalaureate’s Economics for the IB Diploma*](http://www.pearsonschoolsandfecolleges.co.uk/Secondary/BusinessAndEconomics/IBResources/PearsonBaccalaureate/ISBN/Economics/PearsonBaccalaureateEconomicsfortheIBDiplom.aspx) Chapters 2 and 3 sections 2.4, 2.7 and 3.2 and 3.4

**Part 1 Linear Demand Equations:**

1. Assume the demand for ski poles in a small town is represented in the table below:

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| --- | --- |
| **Price (dollars)** | **Quantity Demanded** |
| 0 | 200 |
| 4 | 180 |
| 8 | 160 |
| 12 | 140 |
| 16 | 120 |
| 20 | 100 |
| 24 | 80 |
| 28 | 60 |
| 32 | 40 |
| 36 | 20 |
| 40 | 0 |

1. Using the information in the demand schedule above, derive the demand function for ski poles, expressed as Qd=a-bP, where:
   1. Qd is the quantity demanded
   2. ‘a’ is the quantity intercept, or the amount that is demanded at a price of zero
   3. ‘b’ is the price coefficient of demand, or the change in quantity demanded resulting from a $1 change in price
   4. ‘P’ is the price of ski poles.

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1. Draw a graph showing the demand for ski poles on the axes provided below



1. Assume that due to an increase in the popularity of snowboarding, the demand for ski poles decreases, and at each of the prices on the original demand schedule, the quantity demanded is now 40 units lower than it was previously. Create a new demand schedule representing the lower demand for ski poles.

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| **Price** (dollars) | **Quantity demanded** |
| 0 |  |
| 4 |  |
| 8 |  |
| 12 |  |
| 16 |  |
| 20 |  |
| 24 |  |
| 28 |  |
| 32 |  |
| 36 |  |
| 40 |  |

1. Derive a new demand function based on the information in the new demand schedule above.

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1. On the axes below, plot the original demand curve (from part ‘b’) and the new demand curve (from part ‘e’).



1. Now assume that due to rising incomes, skiers in the small town become less responsive to changes in the price of ski poles, therefore for every $1 change in price, the quantity demanded changes by less than it did before. The new demand schedule is:

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| **Price (dollars)** | **Quantity Demanded** |
| 0 | 200 |
| 4 | 184 |
| 8 | 168 |
| 12 | 152 |
| 16 | 136 |
| 20 | 120 |
| 24 | 104 |
| 28 | 88 |
| 32 | 72 |
| 36 | 56 |
| 40 | 40 |

1. Derive a new demand function from the schedule above. Explain what has changed about demand based on your new demand function.

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1. On the axes below, plot the original demand curve (from part ‘b’) and the new demand curve based on the function you derived in part ‘h’.



**Part 2 Linear Supply Equations:**

1. Assume the supply of ski poles in a small town is represented by the table below:

|  |  |
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| **Price** (dollars) | **Quantity supplied** |
| 0 | -100 |
| 4 | -60 |
| 8 | -20 |
| 12 | 20 |
| 16 | 60 |
| 20 | 100 |
| 24 | 140 |
| 28 | 180 |
| 32 | 220 |
| 36 | 260 |
| 40 | 300 |

1. Using the supply schedule above, derive a supply function for ski poles in the form, Qs=-c+dP, where:
   1. Qs is the quantity supplied
   2. ‘c’ is the quantity intercept, or the quantity that would be supplied if the price were zero
   3. ‘d’ is the price coefficient of supply, or the change in the quantity supplied resulting from a $1 change in the price
   4. ‘P’ is the price of ski poles.

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1. Draw a graph showing the supply of ski poles on the axes below:



1. Now assume that there is a significant increase in the costs of production of ski poles and the quantity supplied therefore decreases at each price by 30 units. Create a new supply schedule demonstrating the impact of the higher production costs for ski poll manufacturers:

|  |  |
| --- | --- |
| **Price** (dollars) | **Quantity supplied** |
| 0 |  |
| 4 |  |
| 8 |  |
| 12 |  |
| 16 |  |
| 20 |  |
| 24 |  |
| 28 |  |
| 32 |  |
| 36 |  |
| 40 |  |

1. Derive a new supply function based on the supply data in the table above.

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1. Plot the original supply curve and the new supply curve on the axes below. Explain what has happened to the supply of ski poles next to your graph:



1. Now assume that due to and improvement in supply-chain efficiency, ski poll producers are able to be more responsive to changes in the demand for ski poles, therefore are able to increase or decrease the quantity they supply more easily as the price changes. The new supply schedule looks like this:

|  |  |
| --- | --- |
| **Price** (dollars) | **Quantity supplied** |
| 0 | -100 |
| 4 | -50 |
| 8 | 0 |
| 12 | 50 |
| 16 | 100 |
| 20 | 150 |
| 24 | 200 |
| 28 | 250 |
| 32 | 300 |
| 36 | 350 |
| 40 | 400 |

1. Derive a new supply function based on the new supply schedule for ski poles.

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1. Graph the supply curve based on the new function, along with the original supply curve (from part ‘b’) on the axes below.



**Part 3 Finding Equilibrium using Linear Supply and Demand Equations:**

1. On the axes below, plot the original demand and the original supply for ski poles (using the equations you derived in parts ‘b’ in the two sections above).



1. Use the original demand and supply equations to calculate the equilibrium price and quantity of ski poles.

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1. Calculate the quantities supplied and demanded for ski poles at a price of $28. Explain why market forces make a price of $28 unrealistic.

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1. Calculate the quantities supplied and demanded for ski poles at a price of $12. Explain why market forces make a price of $12 unrealistic.

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1. Assume the demand for ski poles decreases as described in #1, d. At the lower level of demand, calculate the quantity demanded at the original equilibrium price. How does this compare to the quantity supplied at the original equilibrium price?

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1. Demand has fallen, but supply remains unchanged. Determine the new equilibrium price and quantity of ski poles using the demand equation you derived in #1, d and the original supply equation.

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1. Illustrate the effect of the decrease in demand for ski poles on the axes below:



1. Assume that following the decrease in demand for ski poles, the supply also decreases as described in #2, d. Once demand and supply both decreased, calculate the new equilibrium price and quantity of ski poles.

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1. Illustrate the effect of the decreased supply on the equilibrium price and quantity on the axes below:



1. Besides the factors that caused the demand and supply for ski poles to change described in this lesson, identify three additional determinants of demand and three determinants of supply that could affect the ‘a’ and ‘c’ variables in the demand and supply equations

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| **Determinants of demand for ski poles:** | **Determinants of supply for ski poles:** |

**Part 4 Consumer and Producer Surplus in a linear demand and supply model**

1. Re-draw the graph showing the original equilibrium price and quantity of ski poles (the graph you drew for #3, a). Outline the areas representing the consumer and producer surplus in the market at the equilibrium price and quantity.



1. Calculate the amount of consumer surplus and the amount of producer surplus in the market for ski poles. Calculate the amount of *total welfare* in the market for ski poles at the equilibrium price and quantity.

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| **Consumer surplus =** ½(bxh) of the triangle below the demand curve and above the equilibrium price. You must first calculate the ‘p-intercept’ of demand. To do this set the quantity to zero and determine what the price would be at when Qd=0. | **Producer surplus =** ½(bxh) of the triangle above the supply curve and below the equilibrium price. To determine the height of this triangle, subtract the ‘p-intercept’ of supply from the equilibrium price. | **Total welfare**= the sum of producer and consumer surplus. |

1. Assume the price of ski poles was $28. Draw the graph showing the effect on quantity demanded and quantity supplied, and outline the areas representing consumer and producer surplus at a price of $28.



1. Calculate the amount of consumer surplus and the amount of producer surplus at a price of $28 (assuming the number of ski poles sold is equal to the quantity demanded at $28). Calculate the amount of total welfare in the market at $28.

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| **Consumer surplus =** the total area below the demand curve and above the price. | **Producer surplus =** the total area below the price and above the supply curve (only out to the quantity actually being sold in the market) | **Total welfare in the ski poll market:** |

1. Assume the price of ski poles was $12. Draw the graph showing the effect on quantity demanded and quantity supplied, and outline the areas representing consumer and producer surplus at a price of $12



1. Calculate the amount of consumer surplus and the amount of producer surplus at a price of $12 (assuming the number of ski poles sold is equal to the quantity demanded at $12). Calculate the total welfare at a price of $12.

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| **Consumer surplus =** the total area below the demand curve and above the price. (only out to the quantity actually being sold in the market) | **Producer surplus =** the total area below the price and above the supply curve | **Total welfare in the ski poll market:** |

1. Based on the calculations of total welfare you made above, explain why both $28 and $12 are considered *inefficient*. (Refer to the concepts of marginal benefit and marginal cost in your explanation):

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| **$28 is inefficient because:** | **$12 is inefficient because:** |

1. Explain why the equilibrium price and quantity of ski poles is the *most efficient* price in the market. (refer to the concepts of marginal benefit and marginal cost in your explanation).

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| **The equilibrium price is efficient because:** |